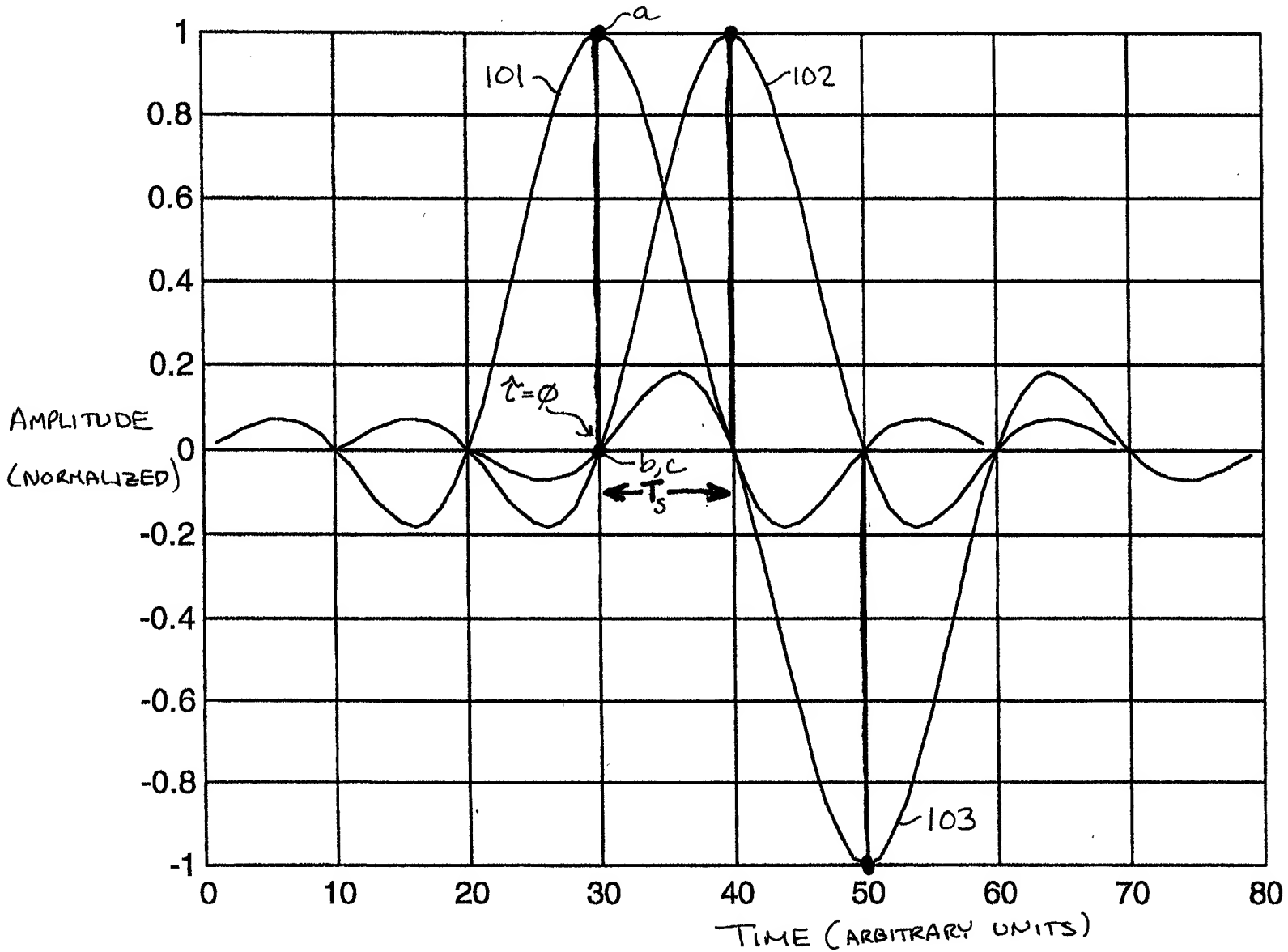


FIG. 1A
(PRIOR ART)

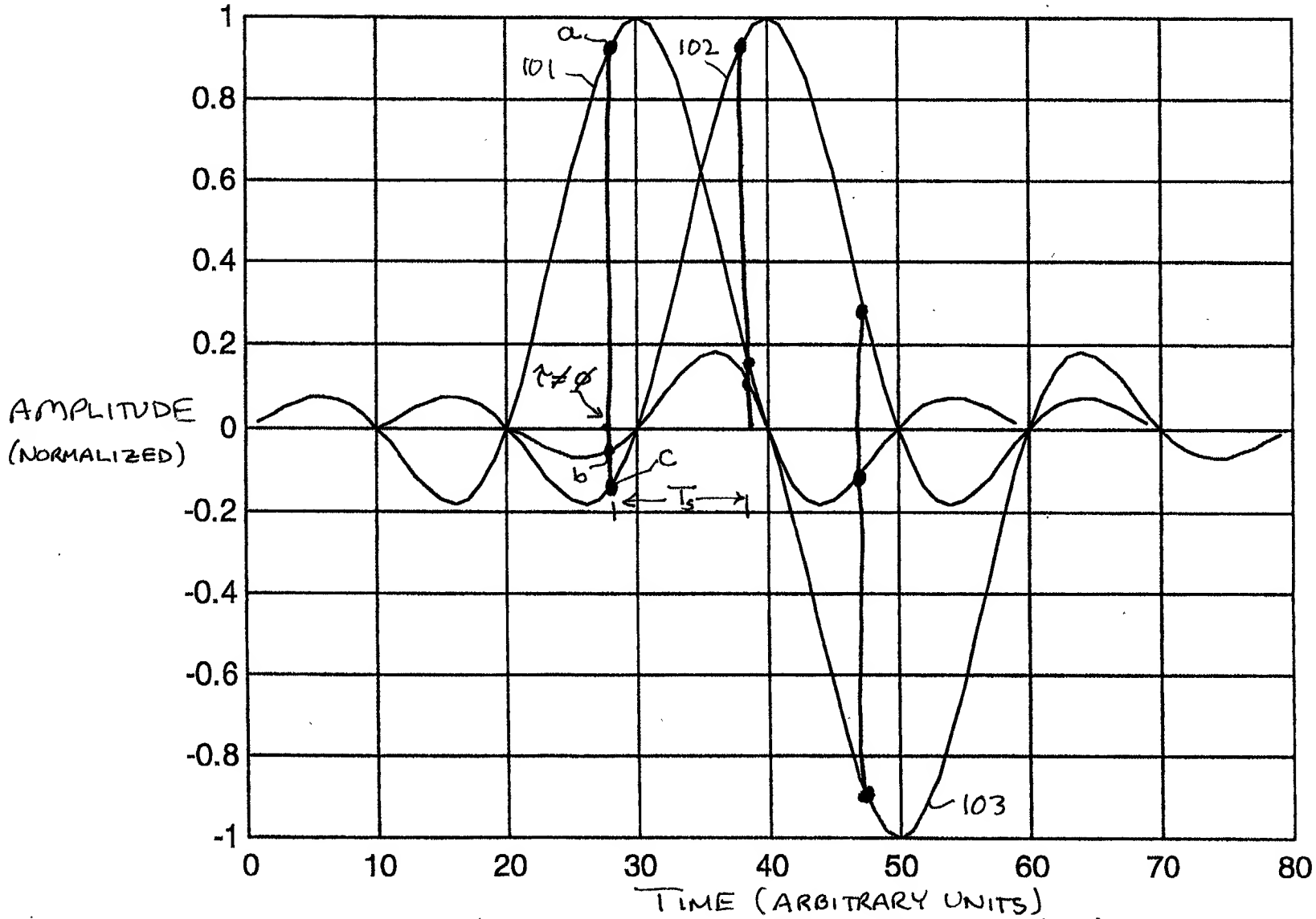


FIG. 1B
(PRIOR ART)

Non ideal sampling yielding ISI. $\tau \neq 0$

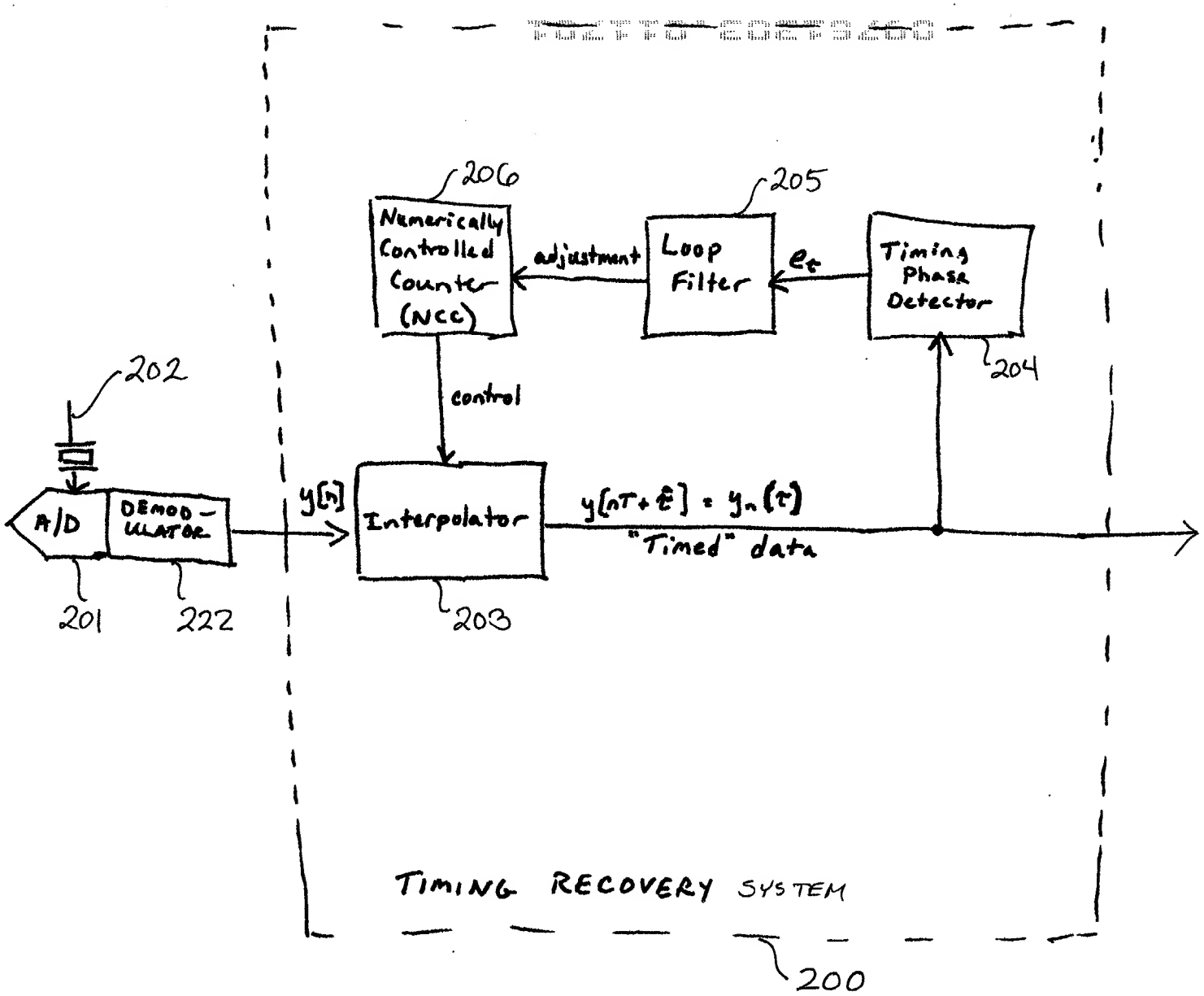


FIG. 2 (PRIOR ART)

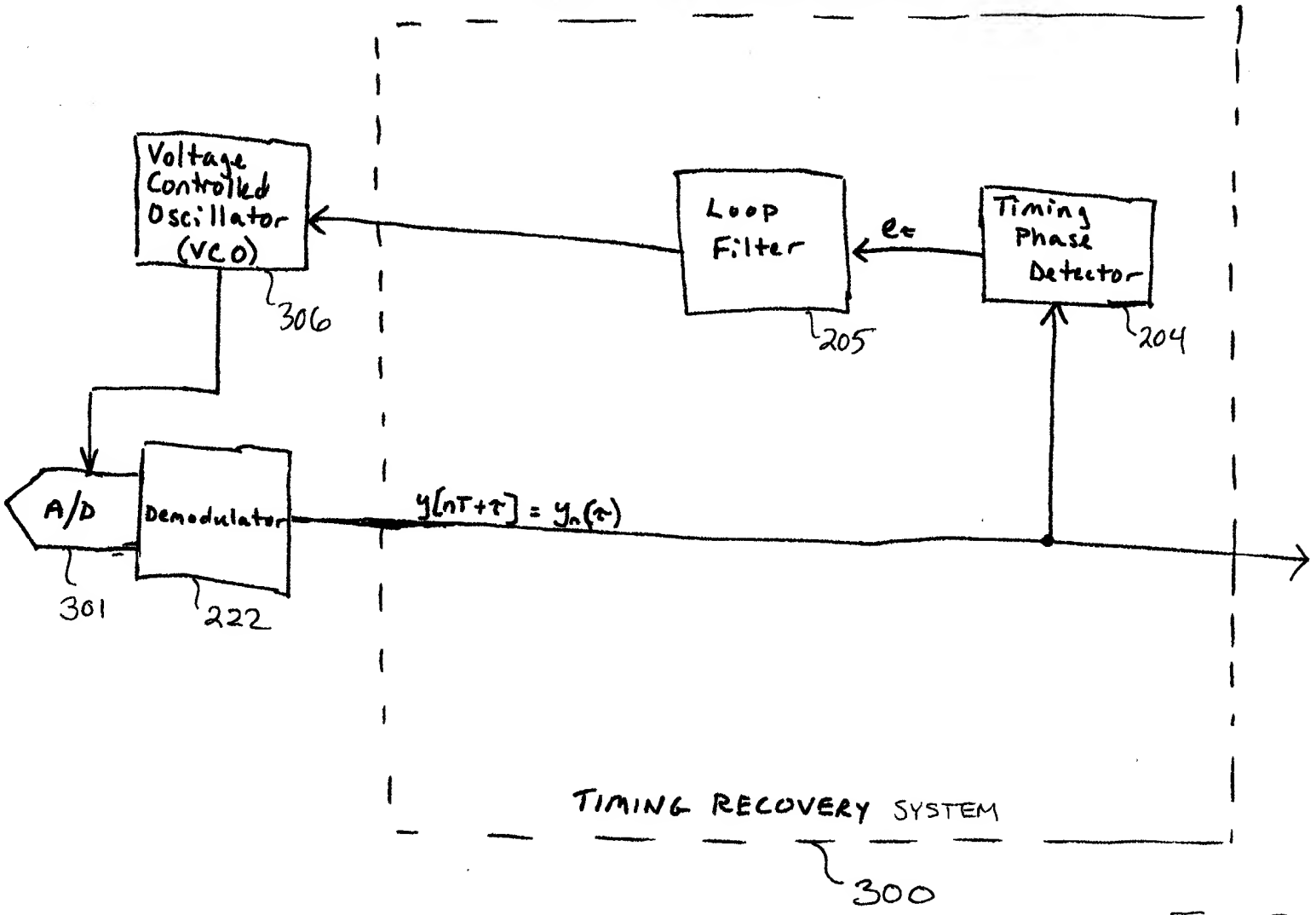
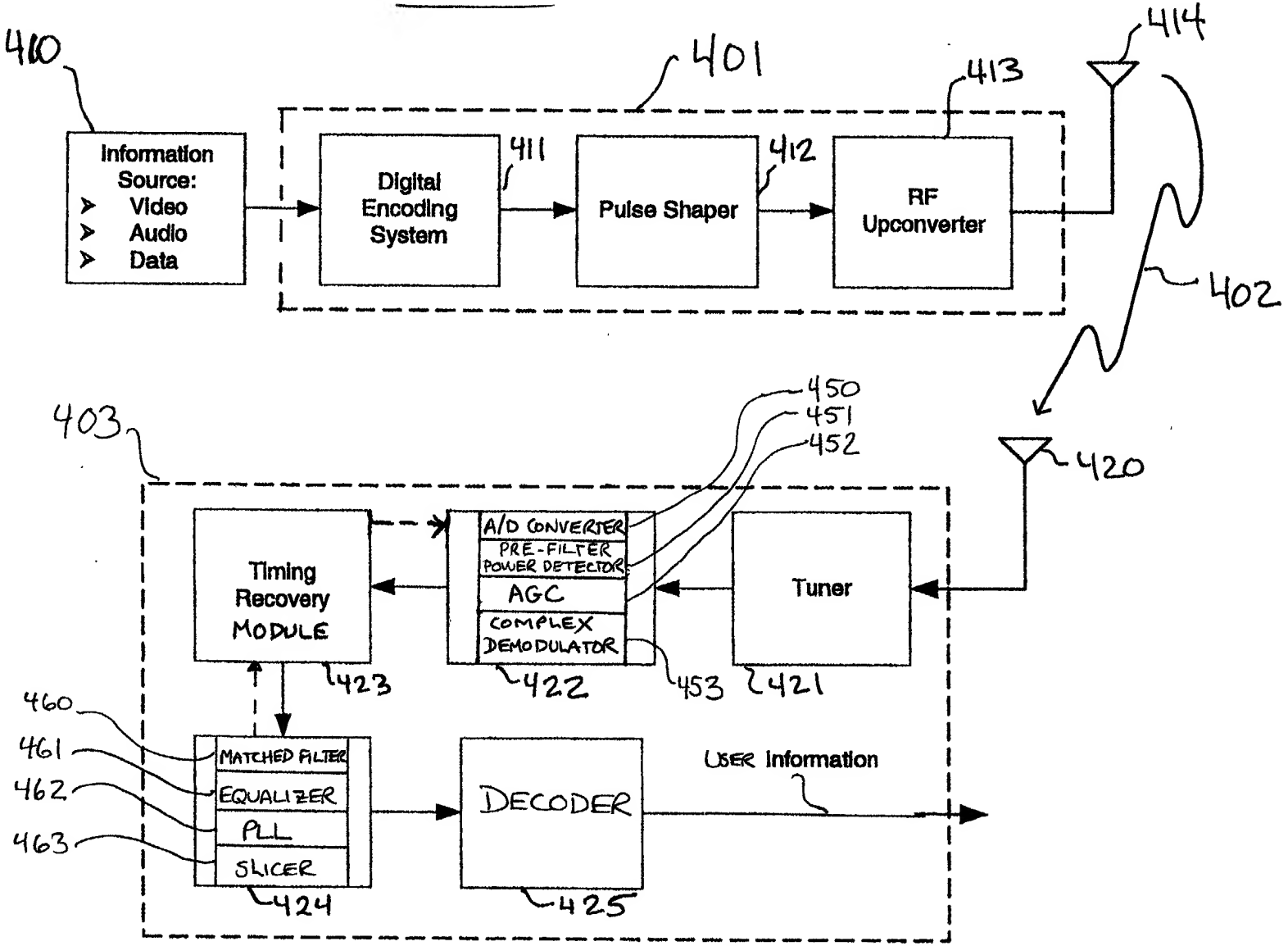


FIG. 3
(PRIOR ART)

FIG. 4


400
410
Information Source:
Video
Audio
Data
401
411
Digital Encoding System
412
Pulse Shaper
413
RF Upconverter
414
402
403
450
451
452
420
A/D CONVERTER
PRE-FILTER POWER DETECTOR
AGC
COMPLEX DEMODULATOR
Timing Recovery MODULE
Tuner
423
422
453
421
460
461
462
463
MATCHED FILTER
EQUALIZER
PLL
SLICER
424
DECODER
425
USER Information

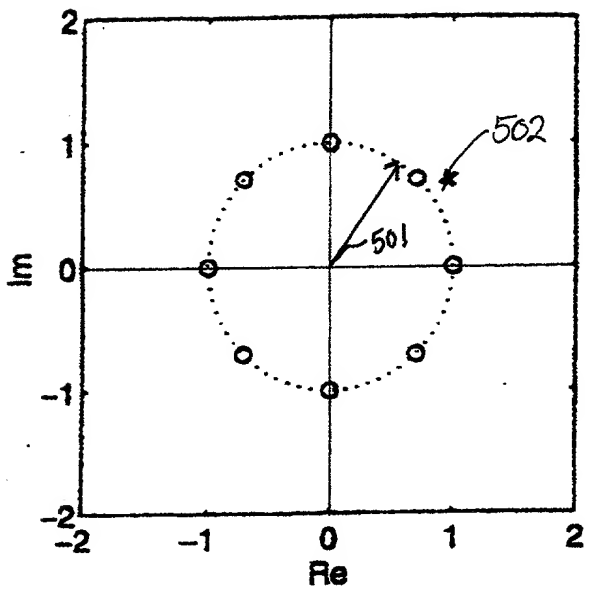


FIG. 5A

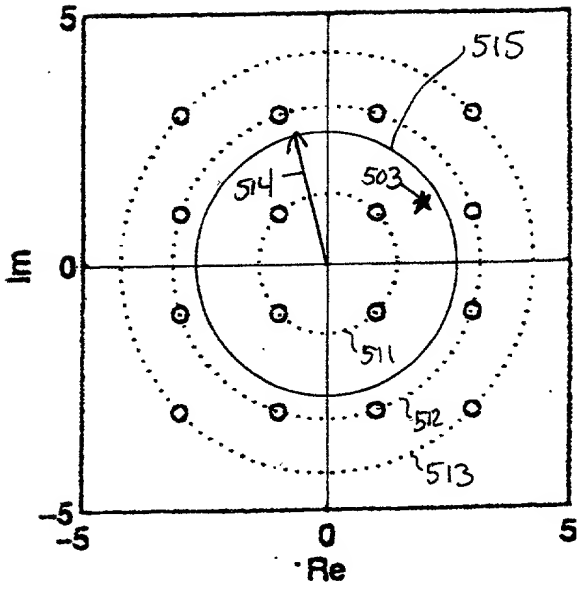


FIG. 5B

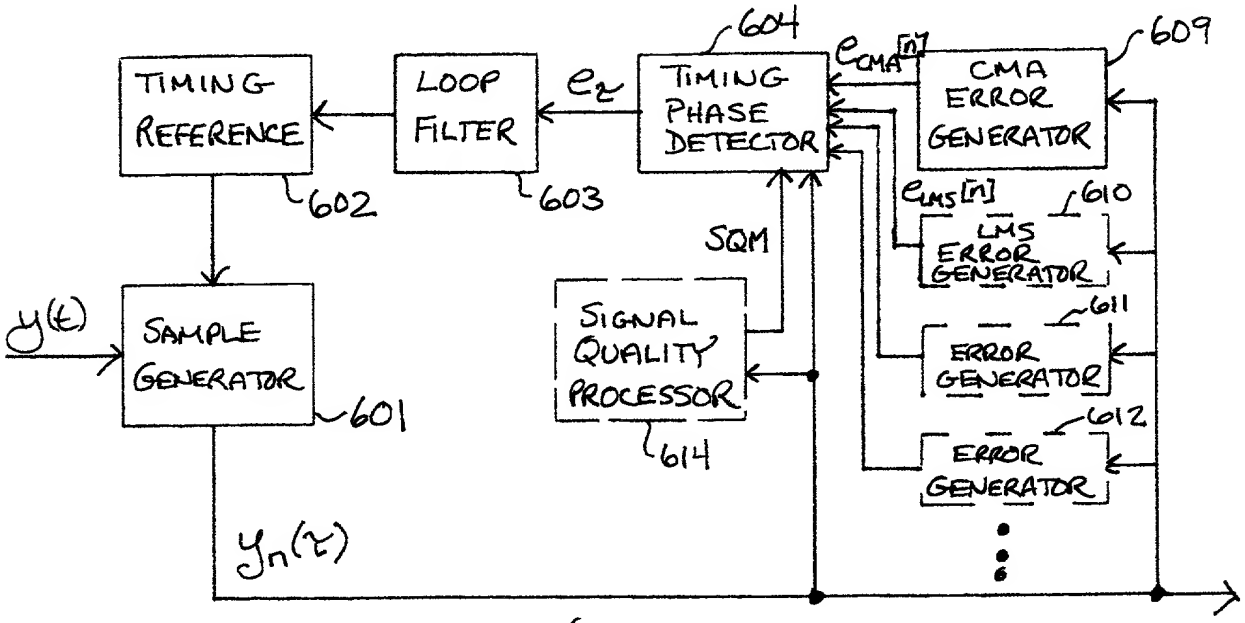


FIG. 6

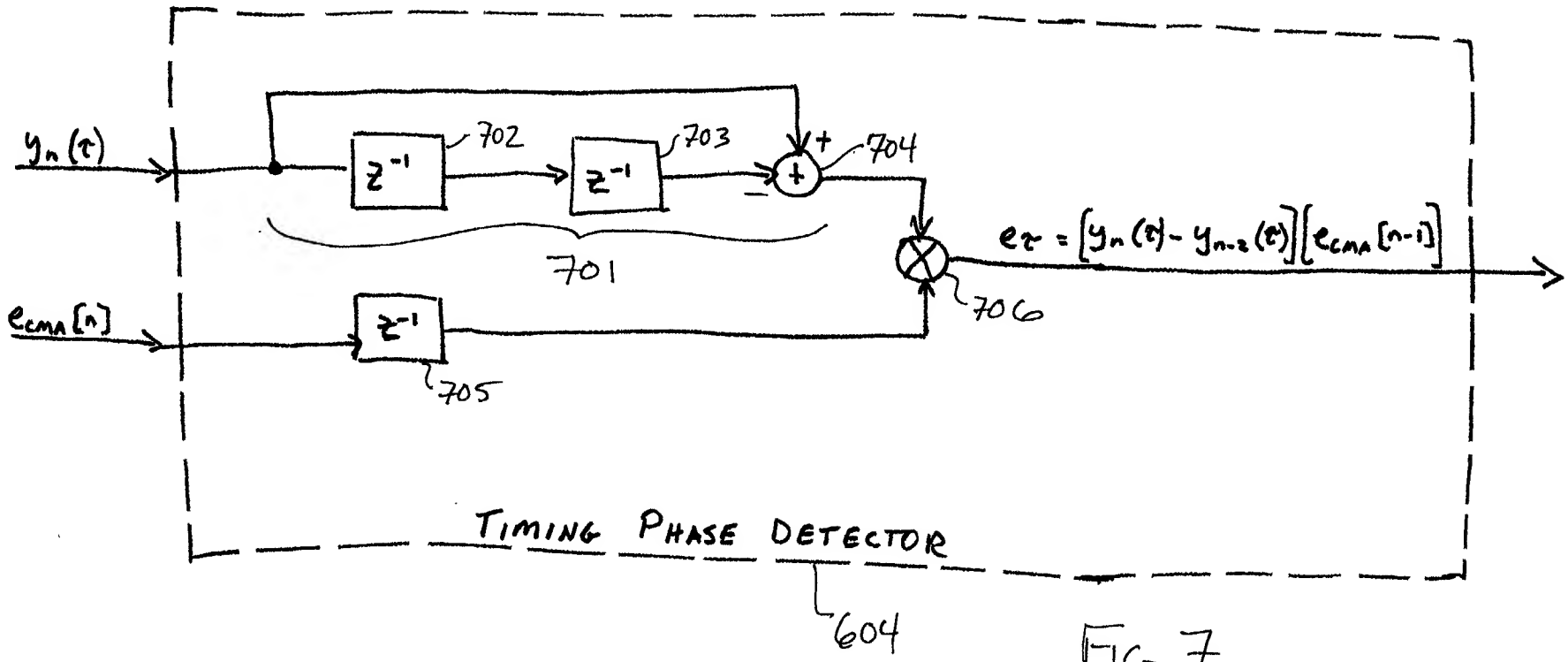

$y_n(\tau)$
z^{-1}
702
z^{-1}
703
+
−
704
701
$e_{cmA}[n]$
z^{-1}
705
$e_\tau = [y_n(\tau) - y_{n-2}(\tau)][e_{cmA}[n-1]]$
706
TIMING PHASE DETECTOR
604

FIG. 7

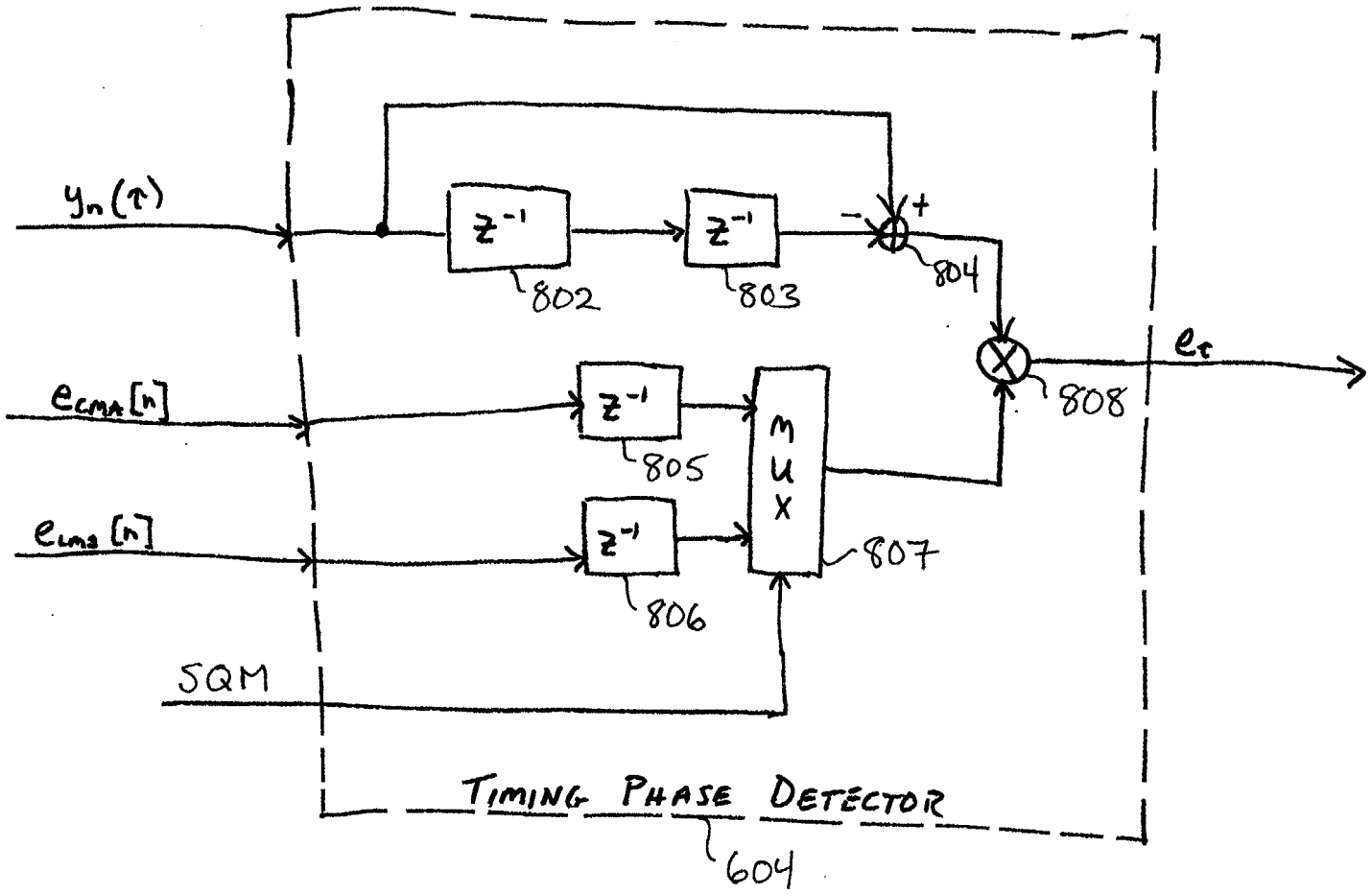

$y_n(\tau)$
z^{-1}
802
z^{-1}
803
−
+
804
$e_{cma}[n]$
z^{-1}
805
$e_{cma}[n]$
z^{-1}
806
MUX
807
808
e_τ
SQM
TIMING PHASE DETECTOR
604

FIG. 8

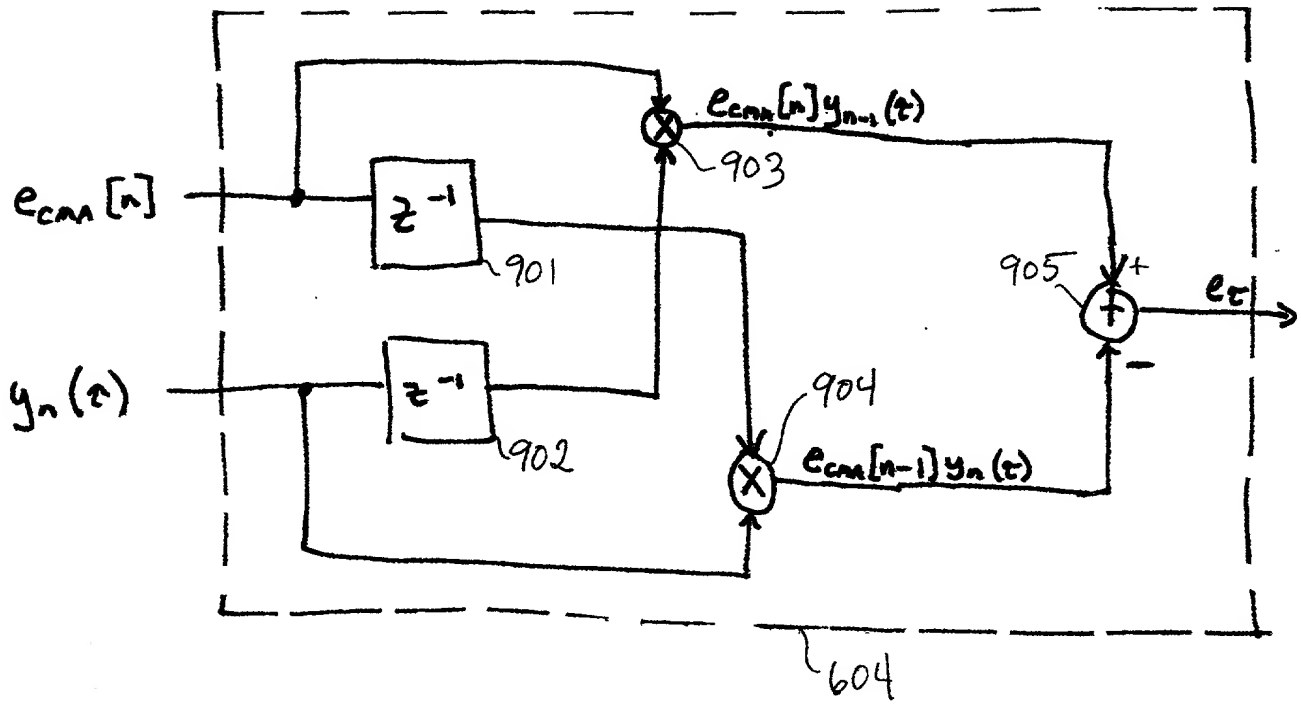

$e_{cmn}[n]$
z^{-1}
901
$y_n(t)$
z^{-1}
902
$e_{cmn}[n]y_{n-1}(t)$
903
904
$e_{cmn}[n-1]y_n(t)$
905
+
−
e_t
604

FIG. 9

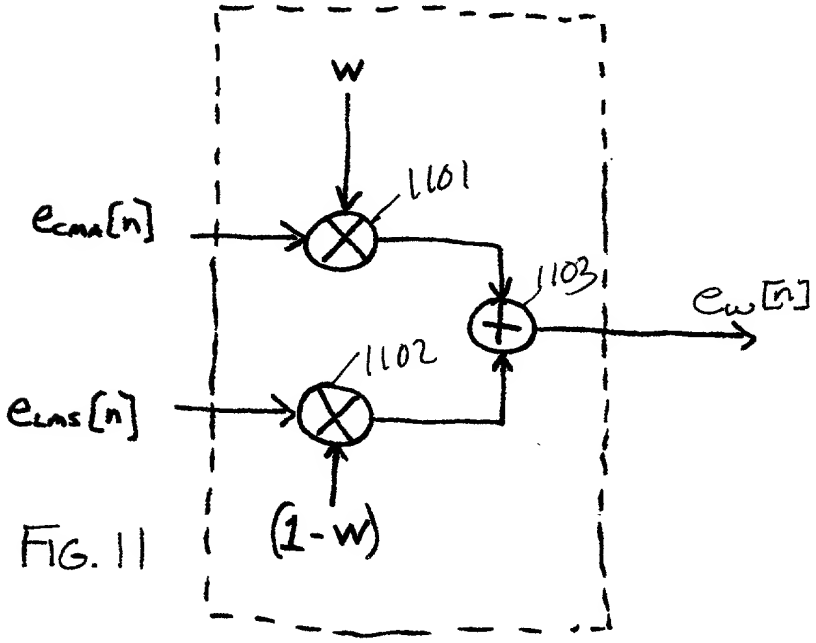

w
1101
$e_{cmn}[n]$
1103
$e_w[n]$
1102
$e_{cms}[n]$
(1-w)

FIG. 11

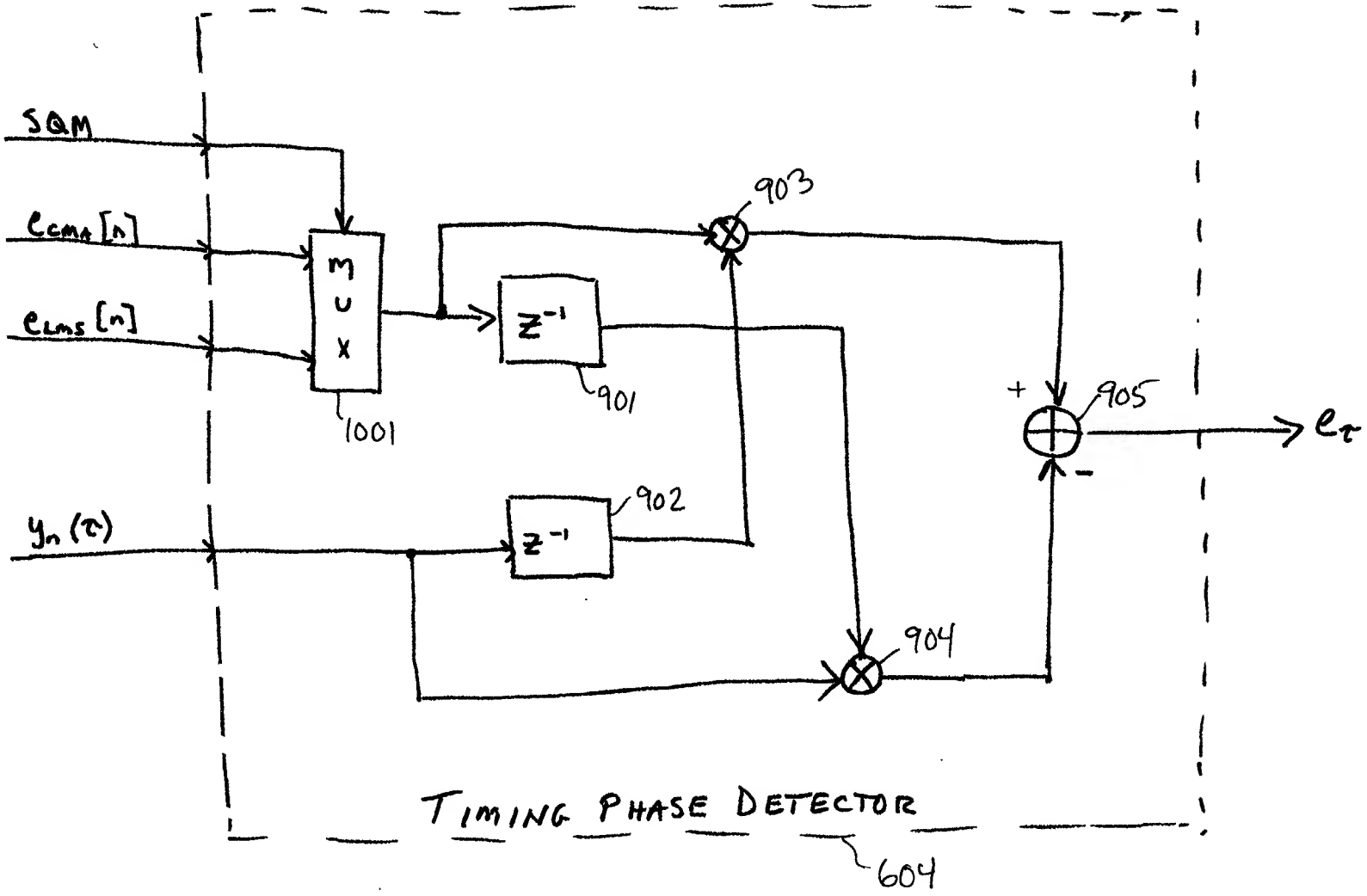

SQM
$e_{cma}[n]$
$e_{cms}[n]$
$y_n(\tau)$
MUX
1001
z^{-1}
901
902
903
904
905
+
-
e_τ
TIMING PHASE DETECTOR
604

FIGURE 10

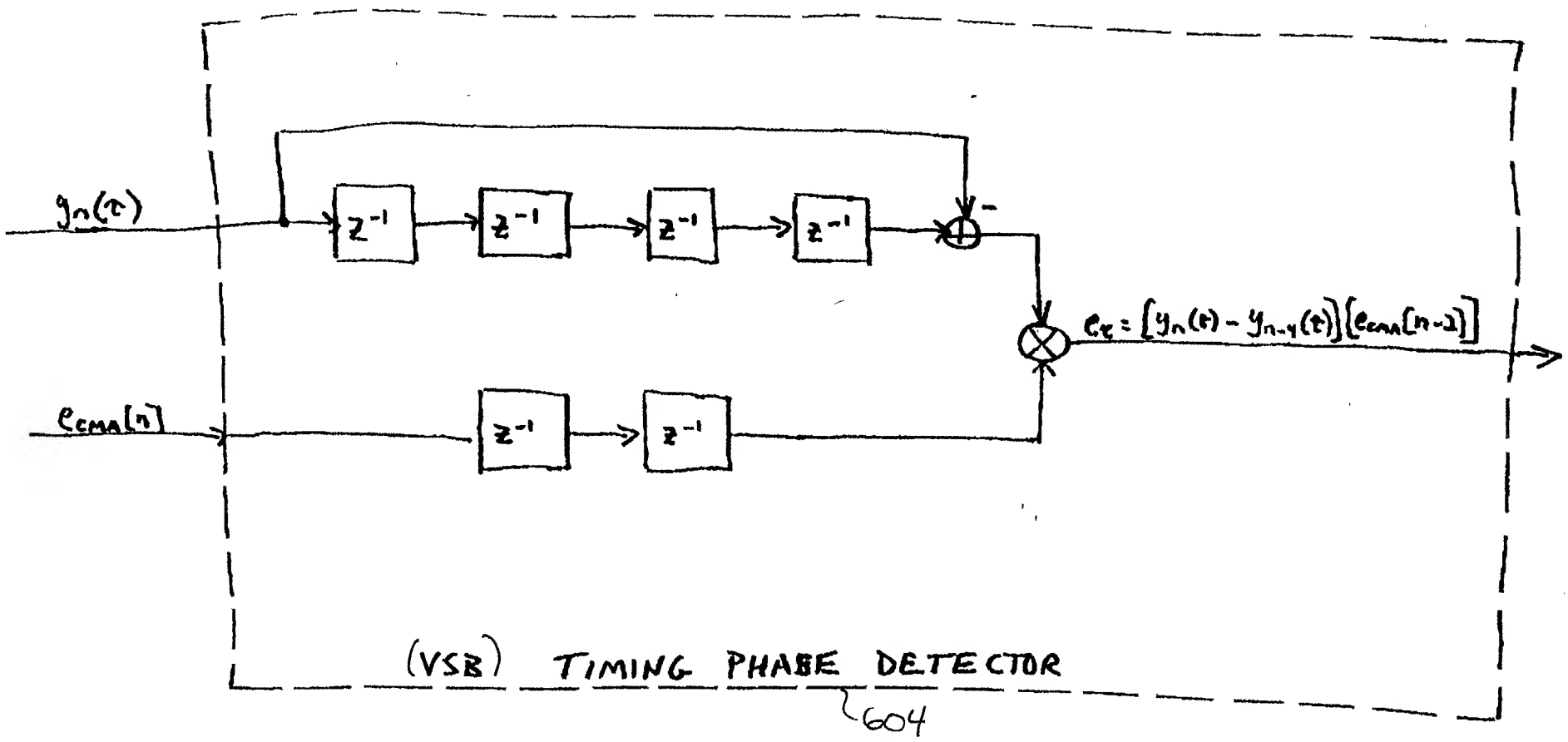

$y_n(t)$
z^{-1}
z^{-1}
z^{-1}
z^{-1}
-
$e_{cma}[n]$
z^{-1}
z^{-1}
$e_t = [y_n(t) - y_{n-4}(t)][e_{cma}[n-2]]$
(VSB) TIMING PHASE DETECTOR
604

FIGURE 12

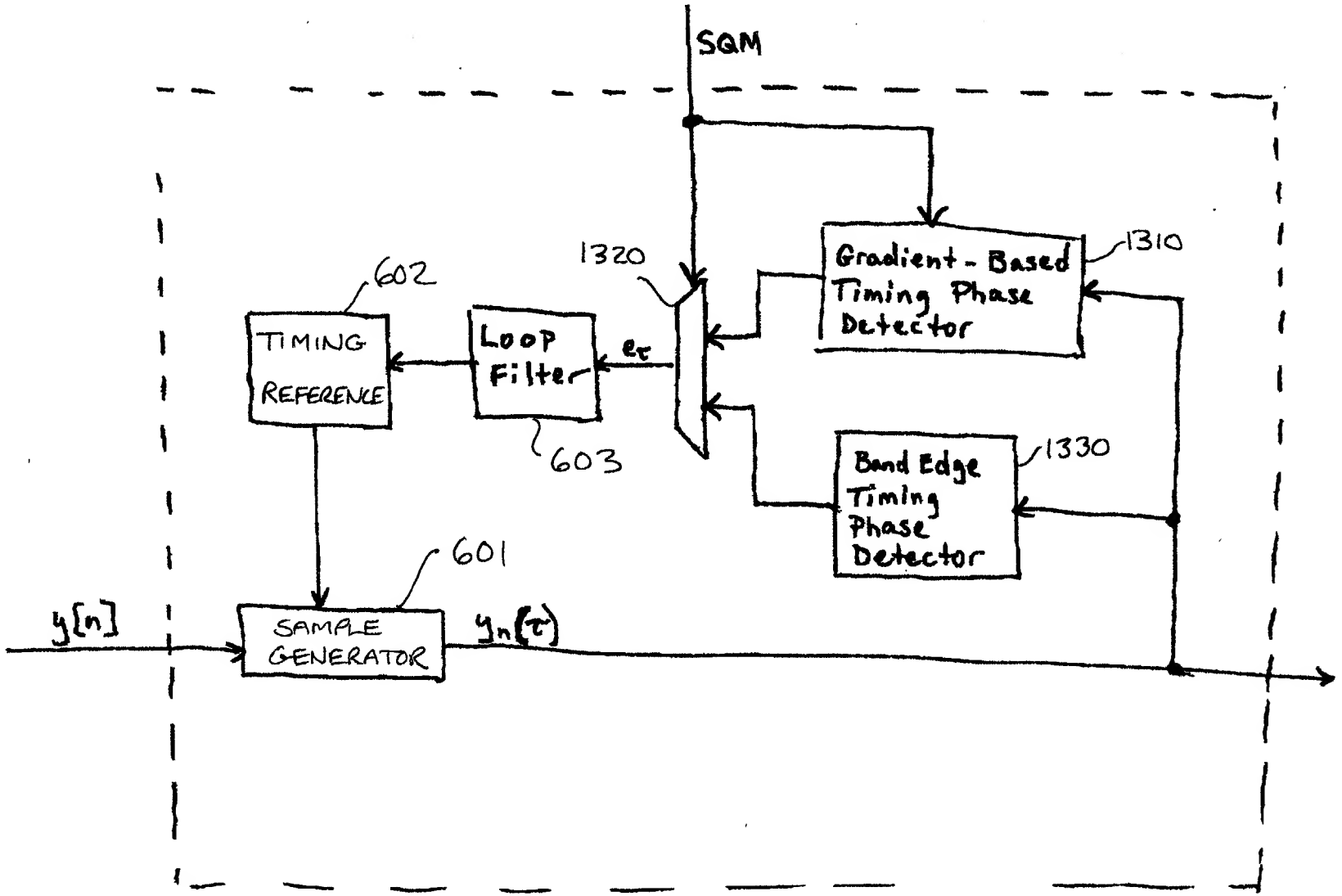

SQM
1320
1310
Gradient - Based Timing Phase Detector
602
TIMING REFERENCE
Loop Filter
e_τ
603
1330
Band Edge Timing Phase Detector
601
y[n]
SAMPLE GENERATOR
$y_n(\tau)$

FIG. 13